(12) UK Patent Application (19) GB (11) 2 325 453 (13) A

(43) Date of A Publication 25.11.1998

(21) Application No 9810314.6

(22) Date of Filing 14.05.1998

(30) Priority Data
(31) 08861146 (32) 21.05.1997 (33) US

(51) INT CL[6]
B65H 35/07

(52) UK CL (Edition P)
B8F F5

(56) Documents Cited
GB 1209176 A GB 0900792 A GB 0862950 A

(58) Field of Search
UK CL (Edition P) B8F F5
INT CL[6] B65H 35/07

(71) Applicant(s)
Eastman Kodak Company
(Incorporated in USA - New Jersey)
343 State Street, Rochester, New York 14650-2201,
United States of America

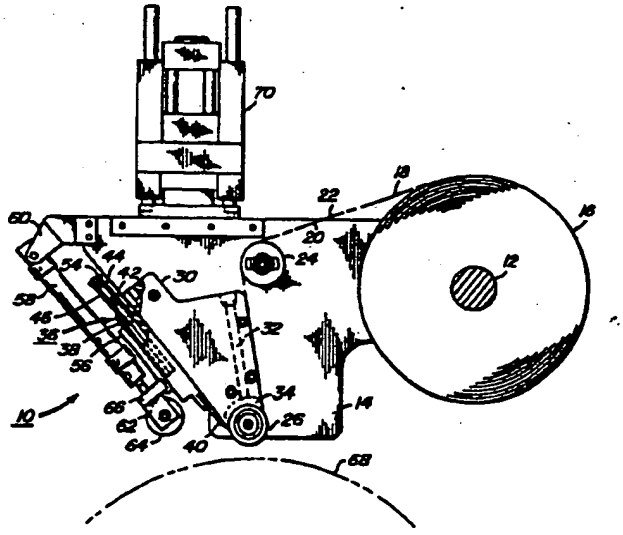
(72) Inventor(s)
Shawn W Ritchie
Charles E Young
Michael L Koelsch

(74) Agent and/or Address for Service
H C Haile
Kodak Limited, Patent Department, Headstone Drive,
HARROW, Middlesex, HA1 4TY, United Kingdom

(54) Abstract Title
Tape Applying Device With Non-Driven Vacuum Roller

(57) A device 10 for applying segments of tape 18 has a non-driven vacuum roller 26 which controls the lead end of the tape 18. As one or more objects 68 are moved past the device it is lowered by cylinder slide mechanism 70 so that vacuum roller 26 contacts the object 68, and the rotation or translation of the object pulls the tape 18 from a stock roll 16. Once a desired length of tape has been discharged, the cylinder slide mechanism 70 raises the device and a slidably mounted knife 40 cuts the tape 18 (figure 7) at a location between the non-driven vacuum roller 26 and the moving object 68. Wipe down roller 64 presses the trailing end of the segment of tape 18 onto the object 68. The lead end of tape 18 is held against the roller 26 for application to the next object 68. The vacuum is supplied to the roller 26 via a vacuum block 30 and conduit 32. A one-way clutch may be provided on the non-driven vacuum roller to prevent rotation in the wrong direction. The cylinder slide mechanism 70 may be a linear slide mechanism and a pneumatic cylinder.

FIG. 1



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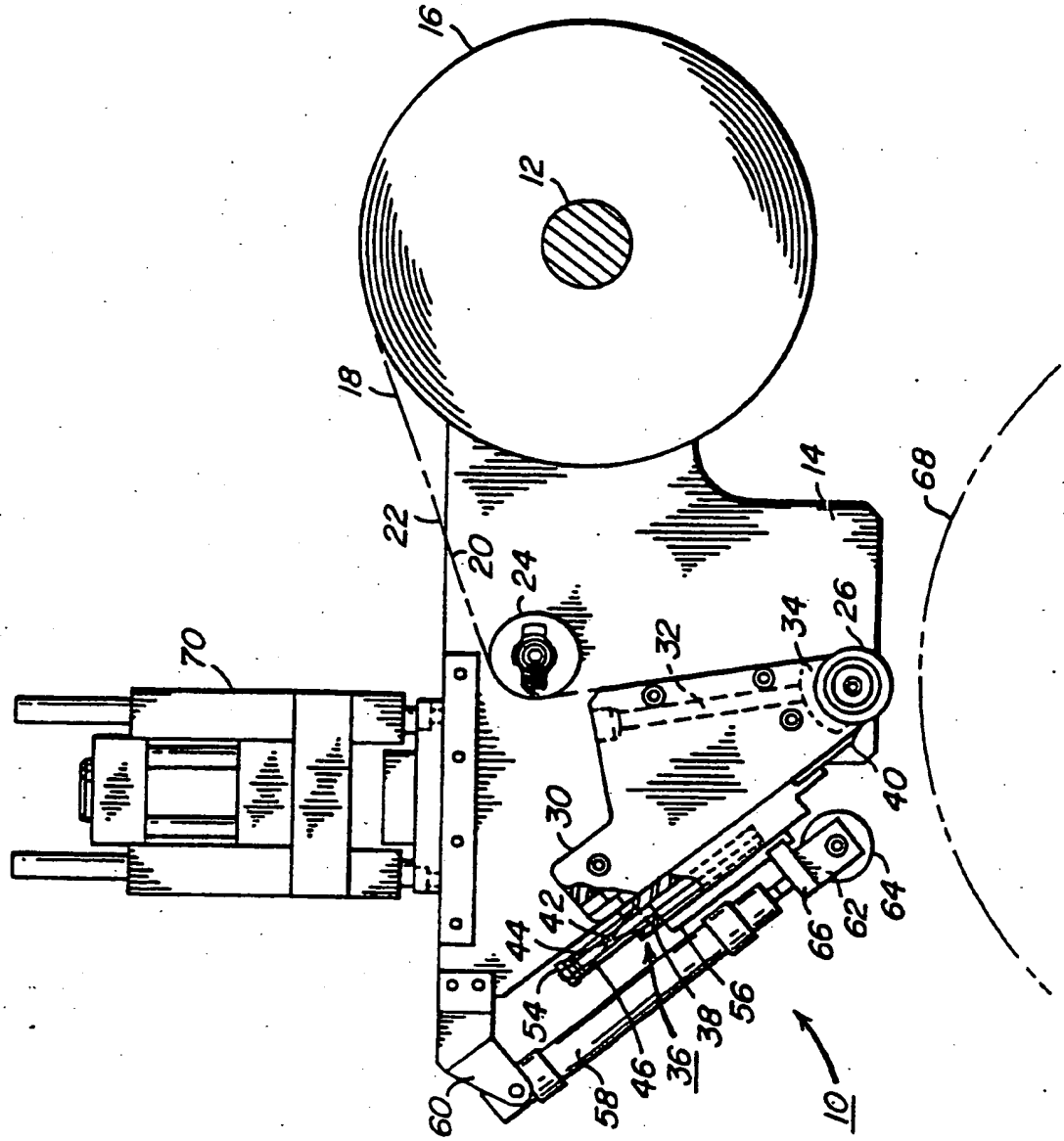
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FIG. 1

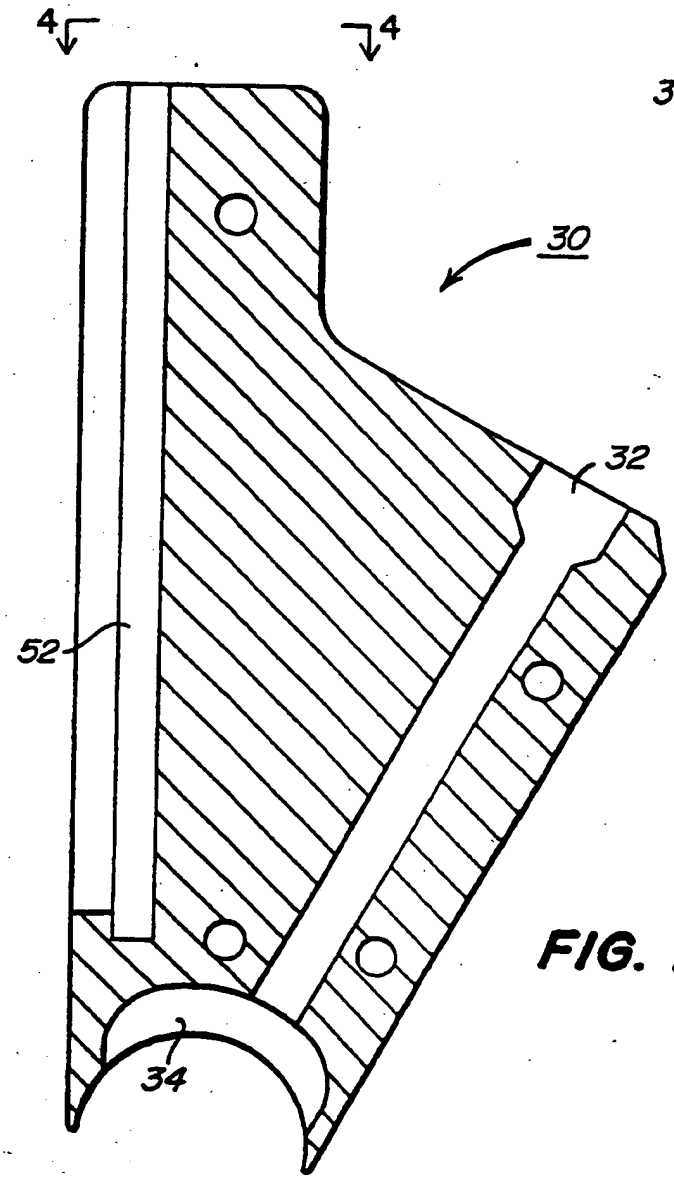

FIG. 2

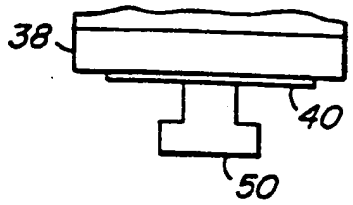

FIG. 3

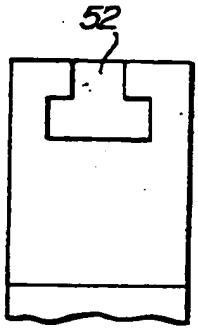

FIG. 4

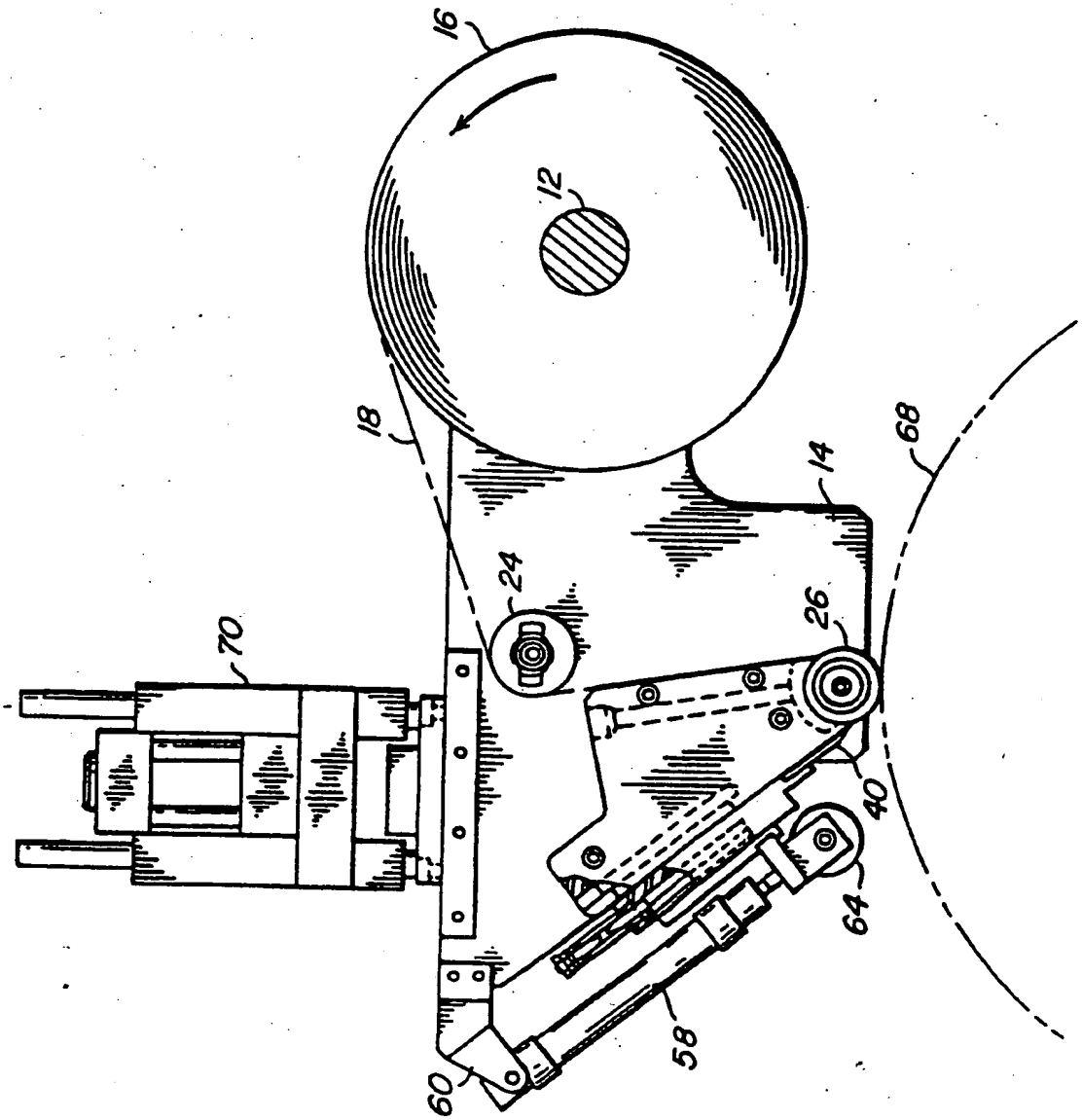

FIG. 5

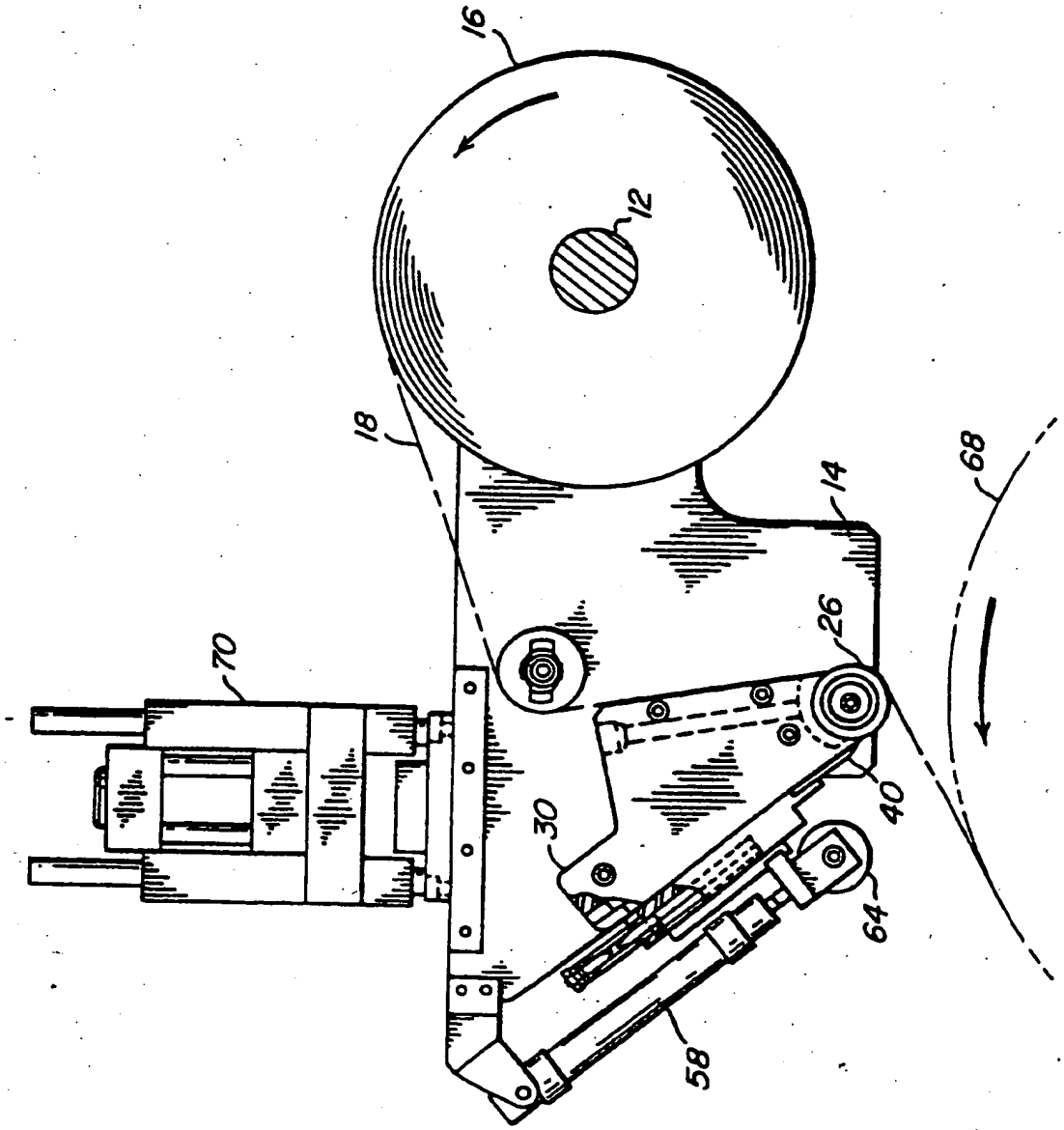

FIG. 6

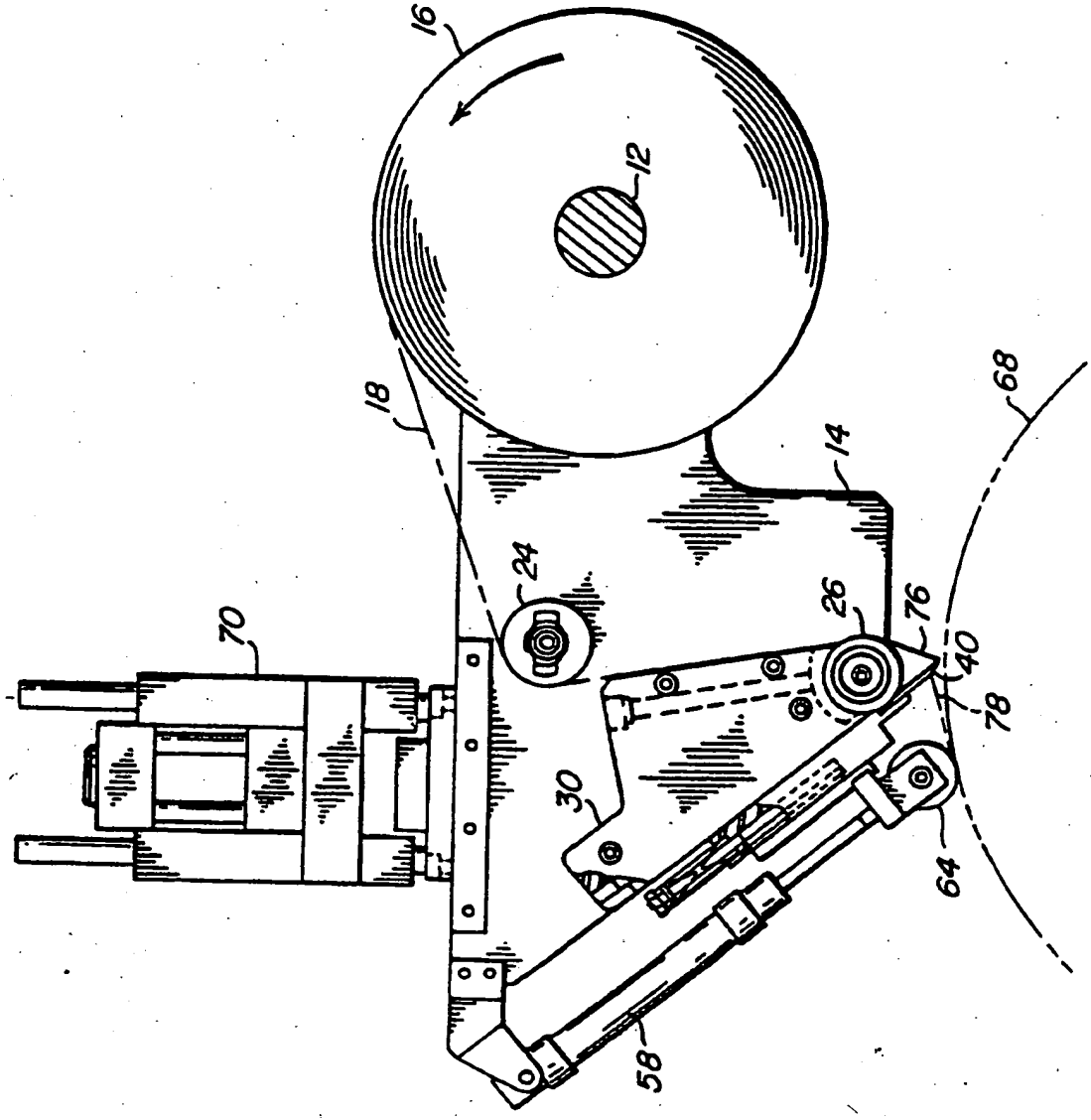

FIG. 7

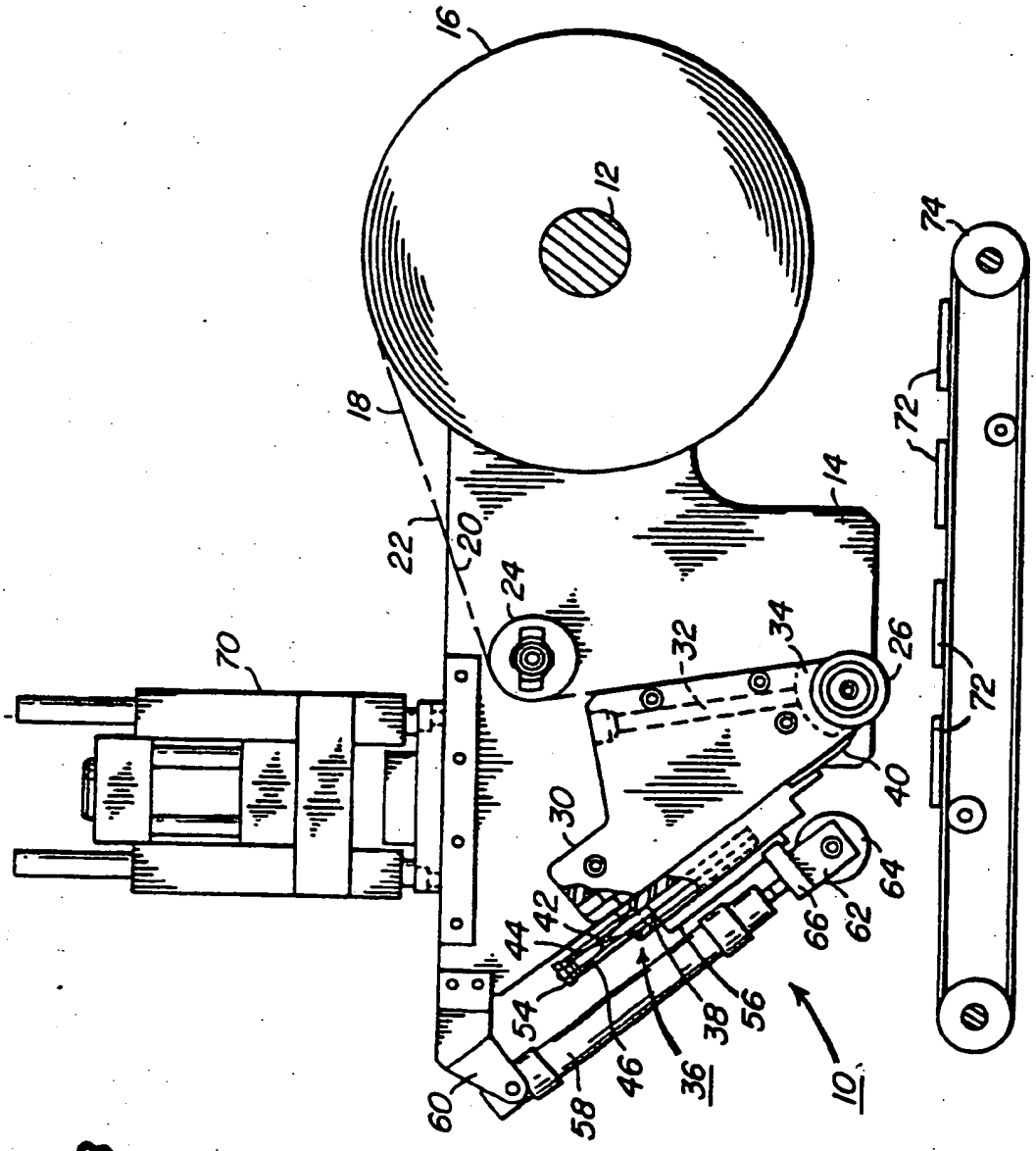
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FIG. 8

U.S. Pat. No. 3,970,507, Dalzell et al., teaches a tape dispenser designed to apply tape in discrete lengths to rotating parts. Tape is dispensed from a reel. From the reel, the tape travels over a roller and crosses a vacuum surface. A displacement means is provided to move the vacuum surface from an initial position to a dispensing position in close proximity to the rotating part so that the adhesive side of the tape at the remote position contacts the rotating part whereby the tape is gripped by the rotating part so that rotation of the part causes the tape to be wound around the part. Cutting means is provided to sever the tape after a predetermined length has been wound around the rotating part. The vacuum surface holds the lead end of the tape after the discrete length has been severed and wrapped about the rotating part.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a tape applicating device which positively controls the lead end of the tape after a discrete length has been cut therefrom and applied to an object being supported on a conveyor system.

It is a further object of the present invention to provide a tape applicating device which includes a vacuum applicator roll wherein the discrete lengths of tape are cut downstream of the vacuum applicator roll.

Briefly stated, these and numerous other features, objects and advantages of the present invention will become readily apparent upon a reading of the detailed description, claims, and drawings set forth herein. These features, objects, and advantages by using a relatively small diameter vacuum applicator roll to press the tape against the object being conveyed. The applicator roll is engaged by a vacuum box through which a vacuum is supplied from a source to the applicator roll. The vacuum box and applicator roll move in conjunction with one another from a first position away from the object to which the tape is being applied to a second position wherein the applicator roll engages the object thereby pressing the tape against the object. Through translation of the object, tape is pulled from the stock roll. Once the desired discrete length of tape has been pulled, the vacuum block and applicator roll are moved back to the first position and a knife severs the tape in a position between the vacuum roll and the object to which the tape has been applied. In such manner, the lead end of the tape being supplied from the stock roll after the cut is controlled by the vacuum applicator roll thereby preventing the tape application failure which will often occur when the

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applicator attempts to apply tape to the next object when such positive lead end control is not available.

BRIEF DESCRIPTION OF DRAWINGS

Figure 1 is a schematic side elevational view of the tape applicator of the present invention with the vacuum applicator roller in a raised position away from the object to which the tape is to be applied.

Figure 2 is a cross sectional view of the vacuum box.

Figure 3 is an end view of the slide housing from the knife end.

Figure 4 is an end view taken along line 4 - 4 of Figure 2.

Figure 5 is a schematic side elevational view of the tape applicator of the present invention with the vacuum applicator roller pressing the tape against the object to which the tape is to be applied.

Figure 6 is a schematic side elevational view of the tape applicator of the present invention with the vacuum applicator roller in a raised position away from the object to which the tape has been applied in preparation for cutting the tape.

Figure 7 is a schematic side elevational view of the tape applicator of the present invention showing actuation of the knife for cutting the tape.

Figure 8 is a schematic side elevational view of the tape applicator of the present invention with the vacuum applicator roller in a raised position away from the object to which the tape is to be applied where the object is being transported by a generally linear conveyor system as opposed to a rotating system as shown in Figures 1, 5, 6 and 7.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Turning first to Figure 1, there is shown a schematic side elevational view of the tape applicator 10 of the present invention. The tape applicator device 10 includes a stock roll support hub 12 projecting from a support frame 14 for rotatably supporting a stock roll 16 thereon. The tape 18 from stock roll 16 has an adhesive side 20 and a nonadhesive side 22. Tape 18 is fettered around an idler roller 24 and then about a vacuum applicator roller 26. Vacuum applicator roller 26 is a non-driven roller and is supported on support frame 14 for free rotation in a clockwise direction as depicted. A one-way clutch 28 located in the hub of vacuum applicator roller 26 prevents vacuum applicator roller 26 from rotating in a counterclockwise direction.

Vacuum applicator roller 26 is used in conjunction with a vacuum block 30 which is also mounted on support frame 14. Vacuum block 30 includes a conduit 32 which is attached to a vacuum source (not shown). Conduit 32 terminates at vacuum chamber 34 immediately adjacent roller 26. The entire circumferential surface of vacuum applicator roller 26 is perforated such that by drawing a vacuum from the vacuum source, atmospheric air is drawn through vacuum applicator roller 26, vacuum chamber 34, and conduit 32. There is a clearance of approximately 0.001" between vacuum applicator roller 26 and vacuum block 30. This small clearance allows the vacuum applicator roller 26 to turn freely while minimizing the loss of vacuum applied to vacuum applicator roller 26. It should be appreciated by those skilled in the art that the combination of the vacuum applicator roller 26 and vacuum block 30 could be replaced with a ported, sectioned vacuum roller. However, such a vacuum roller would require more space and would therefore be detrimental to the space requirements of smaller applications.

Slideably affixed to vacuum block 30 is a linear slide mechanism 36. Linear slide mechanism 36 includes a slide housing 38 to which a knife 40 is affixed. Linear slide mechanism 36 further includes a slide bar 42 slidably mounted within the slide housing 38. Extending from slide housing 38 is spring housing 44 with compression spring 46 residing therein and surrounding a portion of slide bar 42. The proximal end of slide bar 42 is affixed to cap 54 of spring housing 44. Extending from the base plate 48 of slide housing 38 is a T-rail 50 (see Figure 3). T-rail 50 resides in T-slot 52 (see Figure 4) of vacuum block 30 thereby providing a guide track for the movement of slide housing 38 relative to vacuum block 30. Attached to slide bar 42 is plate member 56. Linear slide mechanism 36 is driven through actuation of pneumatic cylinder 58 which, at its proximal end, is attached to a bracket 60 mounted on support frame 14. At the distal end of pneumatic cylinder 58 there is a journal support 62 which rotatably supports a wipe down roller 64. A connector member 66 connects journal support 62 to plate member 56. In such manner, through actuation of pneumatic cylinder 58, as knife 40 is moved into a cutting position, wipe down roller 64 is simultaneously moved toward the tape on the surface of the object 68 to which tape 18 is being applied. As pneumatic cylinder 58 drives linear slide mechanism 36 downward, slide housing 38 reaches a travel stop. However, through compression of spring 46, wipe down roller 64 continues to move into a wipe down position engaging the tape 18 applied and pressing it against the object 68. Thus, through connection of

the wipe down assembly to the linear slide assembly, a single pneumatic cylinder 58 is used to drive both the wipe down roller and the knife 40. It should be appreciated that the knife 40 and the wipe down roller 58 could be driven by two separate means such as, for example, two pneumatic cylinders but that such an arrangement would result in a relative inefficiecy in usage of parts and space.

There is a cylinder slide mechanism 70 positioned at a fixed location within a housing (not shown). Affixed to cylinder slide mechanism 70 for translation thereby is support frame 14. A suitable cylinder slide mechanism for use with the present invention Festo linear guide unit model no. FENG-32-40 as manufactured by Festo Corporation of Hauppauge, NY and powered by a double acting pneumatic cylinder.

In the operation of the tape applicator device 10 of the present invention, once tape 18 is threaded through the devices described above such that the nonadhesive side 22 is drawn against the perforated cylindrical surface of vacuum applicator roller 26 cylinder slide mechanism 70 is used to draw out support frame 14 downward. In such manner, vacuum applicator roller 26 moves from a first position away from the object 68 to which the tape is to be applied as depicted in Figure 1 to a second position where the vacuum applicator roller 26 presses the tape 18 against the object 68 to which the tape is to be applied as depicted in Figure 5. The object to which the tape 18 is to be applied may be a rotating object 68 as depicted in Figures 1, 5, 6, and 7, or may be an object 72 supported on a conveyor system 74 as depicted in Figure 8. With the tape 18 pressed against the object 68, 72, the rotation or translation of the object 68, 72 supplies the force necessary to pull the tape 18 off of stock roll 16. No other feed mechanism for the tape 18 is required. After the desired length of tape 18 is dispensed, cylinder slide mechanism 70 raises support frame 14 as depicted in Figure 6 such that vacuum applicator roller 26 is returned to the first position. Pneumatic cylinder 58 is then actuated to drive linear slide 36 such that knife 40 crosses the path of tape 18 between vacuum applicator roller 26 and the object 68, 72 as depicted in Figure 7. The continued motion of the object 68, 72 pulls the tape 18 against the knife 40 thereby cutting tape 18. The vacuum supplied through vacuum block 30 to vacuum applicator roller 26 draws the lead end 76 of the remaining tape 18 against the perforated surface of vacuum applicator roller 26. In such manner, the lead end 76 is positively controlled to prevent application errors during the application of the next length of tape. Further motion of the object 68, 72 causes the tail end 78 of the applied length of tape to be pressed against the

object 68, 72 by wipe down roller 64. Pneumatic cylinder 58 then returns to its home position thereby retracting knife 40. As mentioned above, the one-way clutch 28 prevents applicator roller 26 from backing up. Thus, the location of the lead end 76 of tape 18 is repeatably controlled with high reliability on the surface of the applicator roller 26.

It will be appreciated by those skilled in the art, that although tape 18 is described herein as being an adhesive tape, the tape 18 may be supplied with a liner attached to adhesive side 20. The device 10 of the present invention could be used with such a lined tape. However, the liner would have to be removed prior to threading the tape around the applicator roller 26 and means would have to be provided for removing such liner. In addition, it is possible that the tape 18 includes a heat activated adhesive. In such case, it would be necessary to provide a heating means to activate the adhesive while the tape 18 is being applied to the object 68, 72.

Through the positive control of the lead end 76 by the vacuum applicator roller 26, the errors and failures typically associated with lack of lead end control are obviated. For example, if a tape has a higher modulus of elasticity, the lead end may stay relatively close to the desired area where it was cut. However, if the tape has a lower elastic modulus, such that it is more stretchy, or the tape is excessively curly, the tape may have a tendency to spring back away from the knife after it has been cut. Consequently the control of the lead end 7 s lost. This will often result in a tape application failure when the applicator atte s to apply tape to the next object because the lead end is not where it is suppose be, and is thus incorrectly applied to the next object. This type of tape contro failure is obviated by the present invention.

From the foregoing, it will be seen that this invention is one well adapted to attain all of the ends and objects here and above set forth together with other advantages which are apparent and which are inherent to the device.

It will be understood that certain features and subcombinations are of utility and maybe employed with reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth and shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

What is Claimed is:

1. A tape applicating device for applying a segment of tape to moving objects comprising:

(a) a frame;

(b) a non-driven vacuum roller supported on said frame;

(c) a stock roll of tape having a lead end wrapped about said non-driven vacuum roller;

(d) means for moving said non-driven vacuum roller between a first position away from the moving object and a second position where said non-driven vacuum roller presses said lead end against the moving objects; and

(e) a knife slidably supported from said frame and positioned to cut the tape at a location between said non-driven vacuum roller and the moving object.

2. A tape applicating device for sequentially applying segments of tape to moving objects comprising:

(a) a frame;

(b) a non-driven vacuum roller supported on said frame;

(c) a stock roll of tape having a lead end wrapped about said non-driven vacuum roller;

(d) means for moving said non-driven vacuum roller between a non-engaging position away from the moving objects and an engaging position where said non-driven vacuum roller presses said lead end against one of the moving objects; and

(e) a knife slidably supported from said frame and positioned to cut the tape at a location between said non-driven vacuum roller and the one of the moving objects thereby creating a new lead end for application to a next one of the moving objects.

3. A tape applicating device as recited in claim 2 further comprising:

(a) a vacuum block engaged with said non-driven vacuum roller, said vacuum block supported on said frame; and

(b) means for supplying a vacuum to said vacuum block.

4. A tape applicating device as recited in claim 2 further comprising:

a wipe down roller positioned downstream of said knife and movable to a non-pressing position to a pressing position for pressing a tail end of the tape segment against the moving object after the tape has been cut with said knife.

5. A tape applicating device as recited in claim 2 wherein:

said stock roll is rotatably supported on said frame.

6. A tape applicating device as recited in claim 2 further comprising:

a one-way clutch for allowing said non-driven vacuum roller to rotate freely in only one direction.

7. A tape applicating device as recited in claim 2 wherein:

said means for moving said non-driven vacuum roller is a linear slide mechanism and a pneumatic cylinder.

8. A tape applicating device as recited in claim 3 wherein:

said means for moving said non-driven vacuum roller is a linear slide mechanism and a pneumatic cylinder.

9. A tape applicating device as recited in claim 5 wherein:

said means for moving said non-driven vacuum also moves said knife and said wipe down roller.

The Patent Office

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Application No: GB 9810314.6 **Examiner:** Emma McLean
Claims searched: 1-9 **Date f search:** 16 July 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): B8F (F5)

Int Cl (Ed.6): B65H 35/07

Other: Online: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	GB 1,209,176	(Minnesota Mining) - see vacuum drum 12	
A	GB 900,792	(Minnestoa Mining) - see vacuum drum 26	
A	GB 862,950	(Cellophane Investment) - see vacuum drum 22	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.